

Application Serial No. 10/577,017
Reply to office action of July 11, 2008

PATENT
Docket: CU-4798

REMARKS/ARGUMENTS

Reconsideration is respectfully requested.

Claims 1-12 and 16-17 are pending before this amendment. By the present amendment, claim 4 is canceled without prejudice, and claims 1, 2 and 16 are amended.

The applicant has rectified various typographical errors noted in the specification. No new matter has been introduced.

In the office action (page 2), **Claims 1-2 and 6** stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Publication No. 2002/0052065 (Ogura). Also, in the office action (page 3), **Claims 1, 5 and 7-12** stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Publication No. 2004/0150104 (Terui).

In the office action (page 4), **Claims 3 and 4** stand rejected under 35 U.S.C. §103(a) as being obvious over Terui.

The applicants respectfully disagree.

The presently claimed invention includes an interposer base (e.g., FIG. 1 21A) and an electronic element (e.g., FIG. 1, semiconductor chip 11). In the present invention, the electronic element can be joined to the interposer base 21A without using adhesive or brazing materials, and without using joining processes utilizing heat.

In the present disclosure, a joining method is used in which the joint area of the electronic element and the joint area of the interposer base have highly smooth surfaces, and are placed in a vacuum environment and pressed together (specification page 20, line 27 to page 21, line 8). Thus, in the presently claimed invention:

--a surface of the electronic element and a surface of the interposer base are integrated with each other **by being brought into direct contact with each other**--.

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In the present invention of claim 1, the portion of the electronic element and the portion of the interposer base to be joined together are made of the same material. **This causes a joining force between the electronic element and the interposer base to be increased** and therefore reliability of the semiconductor device can be improved (Specification page 21, lines 9-19). The applicants have amended claim 1 to clarify this aspect of the presently claimed invention, claim 1 now recites, inter alia:

--wherein the electronic element and the interposer base are made of silicon--

The applicants respectfully submit that neither Terui nor Ogura teach or suggest this element of the presently claimed invention. Also, the applicants respectfully disagree with the examiner allegation on page 4 of the office action, in which the examiner states "it would have been obvious to modify the invention to include electronic element and the interposer that are made of the same material for the purpose of manufacturing cost" (described further below).

As to the rejection of claim 1 over Terui

The present invention provides an electronic device comprising:

--an electronic element; and an interposer including an interposer base to which the electronic element is joined, and a plurality of post electrodes connected to corresponding electrodes of the electronic element; wherein the electronic element and the interposer base are integrated with each other by being brought into direct contact with each other, and the post electrodes are formed directly on the corresponding electrodes of the electronic element, **and wherein the electronic element and the interposer base are made of silicon--**.

Ogura shows, in figure 1F thereof, a structure in which a post electrode embedded in a layer 16 carries a solder 26, which is also embedded in another insulating layer, wherein the layers 16 and the layers 26 of Ogura are **insulating layers**

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and are **removed** in the subsequent step as shown in figure 1G. Ogura is thus silent about the feature as set forth in claims 1, 2 and 16 as amended herein, which recites --the electronic element and the interposer base are made of silicon--.

As described above, in the presently claimed invention, --the electronic element and the interposer base are integrated with each other by being brought into direct contact with each other--. Thus, the electronic element and the interposer base made of silicon allow a joining force between the electronic element and the interposer base to be increased when the two are --brought into direct contact with each other--. This allows for improved reliability.

As stated above, the layers 16 and 26 of Ogura are removed, and thus the joining force between the two is of no importance.

Regarding the rejection of claim 1 over Terui. Terui shows, in figures 4, 6 and 9 thereof, the structure in which the surface of the semiconductor chip 100 ("semiconductor wafer" according to paragraph 0083) is sealed by a resin layer 450 (paragraph 0060). Thus, Terui clearly fails to teach the subject matter as set forth in amended claims 1, 2 and 16.

While the examiner argues, on page 4, last paragraph, that "it would have been obvious to modify the invention to include electronic element and the interposer that are made of the same material or silicon for the purpose of manufacturing cost, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use," Terui **fails** to derive the feature of claim 1, where:

--the electronic element and the interposer base are... brought into direct contact

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with each other--

in view of the fact that there are formed projecting terminals 234 projecting from the post electrodes 461-466. Therefore, a gap is inevitably formed between the sealing resin layer 450 and the surface of the interposer substrate, and the foregoing feature of --the electronic element and the interposer base are... brought into direct contact with each other-- is not attained in Terui. As a result, the device of Terui suffers from the problem of increased height.

Moreover, in the office action (page 4), the examiner alleges:

"it would have been obvious to modify the invention to include electronic element and the interposer that are made of the same material or silicon for the purpose of manufacturing cost, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use"

The applicants respectfully disagree with this allegation. As described above, in the present invention, --a surface of the electronic element and a surface of the interposer base are integrated with each other **by being brought into direct contact with each other--** and the joint surfaces are --made of silicon-- allowing for a **joining force between the electronic element and the interposer base to be increased.**

Thus, the applicants disagree with the examiner when he simply states that the applicants have selected a material based on its known use, as there is no teaching in the prior art references whatsoever of this above described functionality of the present invention. That is, the selection of silicon as being the same material used for the electronic element and the surface of the interpose base allows for a joining force to be increased, which is clearly not simply selecting a material based on its suitability for the intended use.

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Moreover, the examiner's rational "for the purpose of manufacturing cost" has no evidentiary support whatsoever in the prior art, and finds no support in knowledge generally available. As claimed in claim 1, the interposer and the electronic element are integrated --by being brought into direct contact with each other--. Thus, it is clear that the electronic element and the interposer are at first separate. Thus, it is unclear to the applicant as to how forming the same material on two separate elements saves cost (absent the applicant's disclosure). Moreover, in Terui, as described above, the electronic element and the interposer **are not in direct contact** and thus cannot provide the benefits of the present invention.

The examiner has provided no evidentiary support for this allegation, and therefore this allegation is improper, and the examiner has not made a sufficient prima facie case.

Also, the applicants point out that the examiner has taken official notice when the examiner states that the selection of silicon is within the general skill of a worker in the art for **both** the interposer and the electronic element without any documentary evidence. The examiner is respectfully reminded that ordinarily, there must be some form of evidence in the record to support an assertion of common knowledge. MPEP §2144.03. In fact, MPEP §2144.03(A) states clearly that general conclusions concerning what is "basic knowledge" or "common sense" to one of ordinary skill in the art without **specific factual findings** and some **concrete evidence in the record** to support these findings **will NOT** support an obviousness rejection. (*In re Zurko*, 258 F.3d 1379, 1386).

The applicants respectfully submit that the examiner's contention that silicon is a known material on the basis of its suitability for use in both the interposer and the

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electronic element **at the same time** has not been properly officially noticed, since, as described above, the examiner rational is without support in the prior art, and since, as described above, the use of silicon allows for a joining force between the electronic element and the interposer base to be increased, which is not disclosed or even remotely suggested anywhere in the prior art.

Additionally, the MPEP states that: "If applicant adequately traverses the examiner's assertion of official notice, the examiner must provide documentary evidence in the next Office action if the rejection is to be maintained. As the applicant has pointed out, it is clear that the use of silicon for both the interposer and the electron element is not the selection of a known material on the basis of its suitability for the intended use. Therefore the applicants respectfully request that the examiner provide documentary evidence or withdraw the rejection.

Accordingly, the applicant respectfully submits that claim 1 as amended is in condition for allowance over any of Ogura and Terui. An indication of allowable subject matter with respect to these claims is respectfully requested.

As to independent **claims 2 and 16**, these claims have also been amended to include the limitation --wherein the electronic element and the interposer base are made of silicon--. Therefore, the applicants respectfully submit that Claims 2 and 16 are allowable over the cited prior art references for reasons analogous to those stated above with respect to claim 1.

As to claims 3 and 5-15, the applicants respectfully submit that these claims are allowable at least since they depend from one of claims 1, 2, and 16, which are now

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considered to be in condition for allowance for the reasons above.

Claim 17 stands rejected under 35 U.S.C. §103(a) as being obvious over Terui in view of U.S. Publication No. 2003/0185484 (Chakravorty). The "et al." suffix is omitted in a reference name.

The applicants respectfully submit that this claim is allowable at least since it depends from claim 16, and since Chakravorty fails to make up for the deficiencies of Terui.

For the reasons set forth above, the applicant respectfully submits that claims 1-12 and 16-17, now pending in this application, are in condition for allowance over the cited references. Accordingly, the applicant respectfully requests reconsideration and withdrawal of the outstanding rejections and earnestly solicits an indication of allowable subject matter.

This amendment is considered to be responsive to all points raised in the office action. Should the examiner have any remaining questions or concerns, the examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

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